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COMMENTS ON SOME RECENT CHANGES IN THE
CLASSIFICATION OF THE CIIDAE (COLEOPTERA)

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No. 5 — *Comments on Some Recent Changes in the Classification of the Ciidae (Coleoptera)*

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The family Ciidae includes at present 40 genera and about 550 species. The group has been badly neglected in the past, and although a few excellent local monographs have appeared, the last treatment of the world fauna was published in 1848. The European fauna has probably been more extensively studied than that of any other area, but most of the workers have not been specialists and have tended to be provincial in their approach, completely ignoring, for instance, the contributions to the Holarctic fauna made by Japanese and Americans. Lohse (1964) produced a short paper in which some of the European generic concepts were reexamined and 3 new generic group names proposed. This recent contribution is certainly welcome, since it represents the first step in clarifying the relationships within this difficult group. In the present discussion, I will review Lohse's proposals and reevaluate his concepts in the light of my own work on the North American Ciidae. Since the histories of the various European generic names have been discussed previously, it may seem redundant to include them here; I think this is justified, however, considering that even Lohse overlooked or misinterpreted some of these historical facts.

1. *ENTYPUS*, *RHOPALODONTUS*, AND *SULCACIS*

Although the genera *Entypus* and *Rhopalodontus* represent distinct taxa whose species are only distantly related, the nomenclatural histories of the two names are so interwoven that it seems practical to discuss them together. *Ropalodontus* Mellié (justifiably emended to *Rhopalodontus* by Gaubil, 1849) was first proposed in 1847 for the species *Cis perforatus* Gyllenhal, the main diagnostic character being the expanded, rounded, and externally spinulose protibial apices. In the same year, Redtenbacher described *Entypus*, which included only the species *Cis affinis* Gyllenhal (misidentified as *Apate fronticornis* Panzer), characterized by having 9-segmented antennae, with the 3rd segment longer than the following 3 together, and spinulose protibial

apices. In the following year, Mellie included *C. affinis* in his genus *Ennearthron*, which had been described some months prior to the publication of Redtenbacher's work, and placed *Entypus* in synonymy. Mellie included the true *A. fronticornis* in the genus *Cis*, primarily because of its 10-segmented antennae.

Thomson (1863) considered *Rhopalodontus* and *Orophius* Redtenbacher (= *Octotemnus* Mellie) to be so different from other members of the family that he included them in a separate tribe, the Orophina. Being a careful worker, he found several other characters which consistently distinguished the group, such as the conical, projecting, and subcontiguous procoxae, short prosternum, deep antennal sulci, and subequal 3rd and 4th antennal segments. In the same paper, Thomson noted the close similarity between *Ennearthron affine* (Gyllenhal) and *Cis fronticornis* (Panzer), and in spite of the difference in antennal segmentation, he placed them both in *Entypus*. Mellie's name *Ennearthron* could not be applied, because a very different species, *Cis cornutus* Gyllenhal, had been designated as its type by Demarest (1860). Kiesenwetter (1877) included *Entypus* as a distinct subgenus of *Cis* and added to it a third species, *Ennearthron wagai* Wankowicz, which had been described as having spinulose protibial apices. He considered the Orophina to be a separate family, the Orophidae, to which he added *Xylographus* Mellie. A more extreme view was taken by Seidlitz (1872), who placed these genera in a tribe of the family Anobiidae.

In spite of the efforts of Thomson and Kiesenwetter, most European entomologists chose to ignore these two concepts and to rearrange the above species according to more superficial characters, such as the number and relative lengths of antennal segments. Thus, Jacquelin Du Val (1861) placed *C. fronticornis* in the genus *Rhopalodontus* in spite of its totally different procoxal structure, and returned *affinis* to *Ennearthron*, because of its 9-segmented antennae. In 1915, Peyerimhoff placed *Cis bicornis* Mellie in *Rhopalodontus* on the basis of antennal and protibial characters only, and Nobuchi (1960a) described 2 more species, *R. japonicus* and *R. tokunagai*, which also appear to be in the *fronticornis* group. Until quite recently, then, the genus *Rhopalodontus* contained two distinct and distantly related groups of species: those resembling *Ennearthron affine* and belonging properly to *Entypus* of Redtenbacher and Thomson, and those resembling *R. perforatus*.

The situation was clarified by Lohse (1964), who had restudied the European species carefully enough to recognize the true

relationships. By reviving the concept of Redtenbacher and Thomson and uniting *E. affine*, *R. fronticornis*, and *R. bicornis* into a single genus, he not only called attention to the apparent affinities of these three species, but also eliminated discordant elements from both *Enncarthron* and *Rhopalodontus*. In addition to the above, Lohse added *Cis bidentulus* Rosenhauer to the group. Because of the variation in antennal segments, he proposed the subgenus *Entypocis* (with *C. bidentulus* as its type) for those species with 10-segmented antennae, leaving *Entypus affinis* the only member of the nominate subgenus. *Enncarthron wagai* Wankowicz (1869) (mis-cited in Lohse as *E. wagai* Wanka) was placed in a new genus, *Wagaicis*, because of its very narrow and laminate prosternal process.

I agree with Lohse's revival of *Entypus* and his inclusion of the 4 European species. In my own studies of North American Ciidae, I have encountered two more species, *Cis curtulus* Casey and *Sulcaxis lengi* Dury, which also belong to this group. I have compared these with specimens determined as and fitting the descriptions of *E. fronticornis*, *E. affinis*, and *E. bidentulus*. *C. curtulus* is very similar to *E. bidentulus*, while *S. lengi* is unique in having 9-segmented antennae, a somewhat shortened prosternum, and no sexual modifications on the head of the male. Since *lengi* is here selected as the type of *Sulcaxis* Dury (1917), this genus becomes a junior synonym of *Entypus*. I would tentatively add *R. japonicus* and *R. tokunagai*, both from northern Japan, to this genus, on the basis of descriptions and illustrations. I do not think the proposed division into subgenera is necessary, especially if it is based on the number of antennal segments.

There is one final matter that appears to have been overlooked by all of the workers in the Ciidae. This is the fact that the name *Entypus* was not available when used by Redtenbacher, having already been applied to a pompilid wasp (Hymenoptera) by Dahlbom (1843). *Entypus* is a primary junior homonym and must be replaced. Of the two remaining available names which have been applied to the group, *Sulcaxis* Dury is the oldest and is here considered as a replacement name. Although *Sulcaxis lengi* Dury is the most atypical member of the group, it becomes the type species because of the priority of the generic name. I do not think that *S. lengi* is distinct enough to be placed in a separate genus; if this species were to be removed from the group, however, then Lohse's *Entypocis* is the next oldest available generic name and *E. bidentulus* would be considered the type.

A synonymy and redefinition of *Sulcacis* is given below.

SULCACIS Dury

Sulcacis Dury, 1917, Jour. Cincinnati Soc. Nat. Hist., 22(2):20; Leng, 1920:247. Type, by present designation, *Sulcacis lengi* Dury, 1917:21.
Entypus Redtenbacher, 1847, Faun. Austr., (3):350 (*non* Dahlbom, 1843:35); Thomson, 1863:193; Sahlberg, 1926:78; Lohse, 1964:118. Type, by monotypy, *Cis affinis* Gyllenhal, 1827:628 (misidentified as *Apate fronticornis* Panzer).

Cis (*Entypus*), Kiesenwetter, 1877:190; Reitter, 1878:21.

Entypus (*Entypocis*) Lohse, 1964, Ent. Blätter, 60(2):121. Type, by original designation, *Cis bidentulus* Rosenhauer, 1847:58.

Cis (in part), Gyllenhal, 1827:624; Mellie, 1847:109; Mellie, 1848:236; Lacordaire, 1857:551; Jacquelin Du Val, 1861:237; Seidlitz, 1872:44; Abeille de Perrin, 1874:19; Reitter, 1878:27; Seidlitz, 1891:282; Casey, 1898:78; Schilsky, 1900:37E; Reitter, 1902:47; Dalla Torre, 1911:5; Dury, 1917:5.

Emnearthron (in part), Mellie, 1848:360; Lacordaire, 1857:552; Jacquelin Du Val, 1861:238; Abeille de Perrin, 1874:80; Reitter, 1878:30; Schilsky, 1900:37B; Reitter, 1902:59; Dalla Torre, 1911:23; Nobuehi, 1960a:41.

Rhopalodontus (in part), Jacquelin Du Val, 1861:238; Abeille de Perrin, 1874:76; Reitter, 1878:30; Schilsky, 1900:37D; Reitter, 1902:57; Dalla Torre, 1911:21; Peyerimhoff, 1915:26; Nobuehi, 1960a:39.

Form oblong to elongate, strongly convex and cylindrical; vestiture short, usually dual, consisting of both erect and inclined bristles. Head moderately declined, partly covered by pronotum; frontoclypeal ridge of male usually with 2 small teeth or tubercles; antennal fossa relatively deep. Antenna 9- or 10-segmented, with 3-segmented club; segments III and IV subequal, or III longer than next 2 combined; maxillary palp narrow and elongate. Pronotum somewhat constricted anteriorly, narrowly margined laterally; anterior edge usually simple in both sexes. Elytra with relatively coarse, indistinctly dual, uniform or seriate punctation. Prosternum slightly tumid, concave laterally, slightly shorter than intercoxal process which is narrow but not laminate. Protibia expanded at apex, outer apical angle forming a rounded process bearing several small spines. Metasternum convex, the suture short. Meso- and metatibiae slightly expanded and spinulose at apex. Sternite III of male with median pubescent fovea.

A small genus with species throughout the Holarctic region. Intermediate in its characters between *Cis* and *Eridaulus*, on the one hand, and *Ceracis*, *Wagaicis*, and *Malacocis* on the other, differing from the former by the spinulose protibial apices and from

the latter by the broader intercoxal process. The species which have been studied biologically occur primarily on fungi of the *Polyporus versicolor* group (Pavioir-Smith, 1960).

2. *HADRAULE*, *ERIDAULUS*, AND *XESTOCIS*

Two of Thomson's genera, *Hadraule* and *Eridaulus*, have been involved in considerable taxonomic confusion over the past 100 years. Lohse (1964), in his analysis of the problem, has referred to it as a "nomenklatorischen Tragikömodie," an opinion with which I am inclined to agree.

Hadraule was originally proposed for the species *Cis clongatulus* Gyllenhal, characterized by the somewhat flattened body form, subquadrate prothorax, well-separated procoxae, and regularly striato-punctate elytra. Seidlitz (1872), Kiesenwetter (1877), and Reitter (1878) considered it to be a subgenus of *Cis*. Schilsky (1900) first expanded the subgenus to include certain other species with a more or less parallel form, subquadrate prothorax, and elytra with rows of setae alternating with rows of large punctures. In addition to *C. clongatulus* (misspelled as *clongatus* in text, p. 59), he placed *Cis setifer* Reitter and *Cis striatulus* Mellie within *Hadraule*. Reitter (1902) continued the trend by including the following species as well: *C. scariatopilosus* Motschulsky, *C. heiroglyphicus* Reitter, *C. bifasciatus* Reitter, *C. comptus* Gyllenhal, *C. coriaccus* Baudi, and *C. pumilio* Baudi. Jacobson (1915) doubtfully placed *Cis fusciceps* Mellie, described from North America and Madeira, in the same group. Roubal (1936), having examined the type of *C. clongatulus* and discovered that it had 9-segmented, rather than 10-segmented, antennae, transferred the subgenus (including only the type species) to the genus *Ennearthron* Mellie. Through a misunderstanding of the rules of nomenclature, Roubal replaced *Hadraule* with a new name, *Knablia*. Lohse (1964) restored *Hadraule* and suggested that it be used in the original sense, as a separate genus including only the type species, *Hadraule clongatula*. Lohse further stated that *Cis comptus* and its relatives should be placed in the subgenus *Eridaulus*. This is entirely wrong, being based on an erroneous type designation, as will be explained below. The rest of the species mentioned above do seem to form a natural group, to which the American species *Cis falli* Blatchley, *Cis striolatus* Casey, and *Cis versicolor* Casey might be added. *H. elongatula* shows a marked similarity to members of the *C. comptus* group and also to *Maphoca blaisdelli* Casey, the

latter differing mainly in the number of antennal club segments.

The genus *Eridaulus* Thomson (1863) originally included two species, *Anobium nitidum* Fabricius and *Cis jacquemarti* Mellie, which were characterized by the 10-segmented antennae, reflexed "gular margin," elytra with larger and smaller punctures (dual punctation), short, carinate prosternum, and produced and dentate protibial apices. Seidlitz (1872), Sahlberg (1926), and a few others retained it as a genus, but most later authors reduced it to a subgenus of *Cis*. Seidlitz added *Cis glabratus* Mellie and *C. lineatocribratus* Mellie, and Schilsky (1900) included *C. quadridens* Mellie as well. Roubal added one more European species, *Cis bituberculosus* Roubal, 1937 (= *Cis bituberculatus* Roubal, 1912, *nou* Gorham), and in recent years Chujo (1940), Miyatake (1954), Nakane and Nobuchi (1955), and Nobuchi (1955, 1960b) have described several others from Japan. The only worker to designate a type for *Eridaulus* was Abeille de Perrin (1874), who selected *Cis comptus* Gyllenhal. This species, however, was not originally included in the genus, and is therefore unavailable as a type. In the same work, Abeille de Perrin designated *C. nitidus* as the type of *Entypus*, making a similar error. The name *Eridaulus*, then, is still available for the *Cis nitidus* group, contrary to the statement of Lohse (p. 119), and the type must still be designated. Since I have not examined the type specimens of either *C. nitidus* or *C. jacquemarti*, I hesitate to select one of them as the type at the present time.

In the past several years, I have examined specimens of Ciidae from various parts of the world, and it has become apparent to me that a number of other species described in *Cis* and the majority of those included in *Xestocis* Casey should be placed in *Eridaulus*. Casey (1898) proposed the genus *Xestocis* for 5 North American species with a carinate prosternum. Dury (1917), Brèthes (1922), and Hatch (1962) added 14 more species, and most of those examined fall within this group. Since a type has not been selected for *Xestocis*, I here designate *X. levettei* Casey, the best known of the American species. Miyatake (1954) noted the similarity of *X. levettei* to *Cis* (*Eridaulus*) *konoii* Chujo, and I have noticed the resemblance of the former to *C. nitidus*, with respect to dual elytral punctation, carinate prosternum, dentate protibial apices, secondary sexual characters, male genitalia, and larval urogomphi. I think there is little doubt that *Xestocis* should be considered a junior synonym of

Eridaulus. Since a number of species synonymies and new generic combinations are involved, I will not present here a complete list of American forms to be included in *Eridaulus*, but will publish this separately in a forthcoming revision of the New World species. In addition to the American forms, several species of *Cis* from the Pacific region, such as *Cis pacificus* Sharp (Hawaii) and *C. agariconae* Zimmerman (Micronesia) should be placed in the genus.

Although *Eridaulus* appears to be quite close to the genus *Cis*, I think it should be given generic rank for several reasons. According to Mayr, Linsley, and Usinger (1953), the size of the gap between two genera should be inversely proportional to the sizes of the groups involved. With its present constitution, the genus *Eridaulus* is large enough, both in numbers of species and in extent of distribution, to warrant generic distinction. There are about 30 named species, and several more apparently undescribed, extending throughout the Holarctic region and as far south as New Zealand in the Pacific area. Furthermore, within the genus, several distinct subgroups can be recognized, and certain independent character trends can be followed. Finally, the group displays a biological unity, most of the species being associated with the larger, woody fruiting bodies of fungi such as *Fomes* and *Ganoderma*. This habit, which has been independently evolved in several unrelated genera, such as *Ceracis* and *Xylographus*, may be associated with structural modifications, such as the prosternal carination and convex form of the adult and the increased molar area in the larval mandible. Paviour-Smith (1960) noted that the "headquarters" of *E. nitidus* was the fungus *Ganoderma applanatum*, although the beetle was recorded from several other fungi, and this is quite similar to the host range and headquarters of the American *E. levettei*. Saalas (1923) reported *E. quadridens*, *E. lineatocribratus*, and *E. jacquemarti* from *Fomes pinicola*, and the Japanese species *E. rufocastaneus* and *E. nikkocensis* have been taken on the same fungus. *E. biarmatus* (Mannerheim) and several *Eridaulus* from western North America occur on *Fomes pinicola*, *F. annosus* and related fungi. In Hawaii, where most of the Ciidae are collected by beating dead vines and branches, *E. pacificus* is the only species which has been reported feeding on the woody bracket fungi. It appears to me, then, that the members of this group represent a morphologically and biologically distinct genus, to which the name *Eridaulus* should be applied. Synonymies of

Hadraule and *Eridaulus* and a redefinition of the latter genus are given below.

HADRAULE Thomson

- Hadraule* Thomson, 1863, Skand. Col., 5:182; Sahlberg, 1926:71; Lohse, 1964:119. Type, by monotypy, *Cis elongatulus* Gyllenhal, 1827:627.
- Cis* (*Hadraule*), Seidlitz, 1872:44; Kiesenwetter, 1877:188; Reitter, 1878:24; Seidlitz, 1891:281; Schilsky, 1900:37F (in part); Reitter, 1902:47 (in part); Dalla Torre, 1911:5; Jacobson, 1915:953 (in part).
- Pityocis* Peyerimhoff, 1918, Bull. Soc. Ent. France, 1918:141. Type, by monotypy, *Pityocis coarctatus* Peyerimhoff, 1918:142 (= *Cis elongatulus* Gyllenhal). [See Peyerimhoff, 1933.]
- Emncarthron* (*Knablia*) Roubal, 1936, Festschr. 60 Geburtst. Embrik Strand, 1:53. Type, by monotypy, *Cis elongatulus* Gyllenhal, 1827:627.
- Hadraula* Leng, 1920:246, incorrect subsequent spelling.

ERIDAULUS Thomson

- Eridaulus* Thomson, 1863, Skand. Col., 5:191; Seidlitz, 1872:45; Sahlberg, 1926:79. Originally included species: *Anobium nitidum* Fabricius, 1792:238 and *Cis jacquemarti* Mellie, 1848:328. Type not designated.
- Cis* (*Eridaulus*), Kiesenwetter, 1877:191; Reitter, 1878:21, 24; Seidlitz, 1891:281; Schilsky, 1900:37F; Reitter, 1902:48; Dalla Torre, 1911:5; Roubal, 1912:29; Roubal, 1937:39; Chujo, 1940:132; Miyatake, 1954:49; Nakane and Nobuchi, 1955:49; Nobuchi, 1955:56; Nobuchi, 1960b:65.
- Xestocis* Casey, 1898, Jour. New York Ent. Soc., 6(2):85; Dalla Torre, 1911:20; Dury, 1917:15 (in part); Leng, 1920:247; Hatch, 1962:231. Type, by present designation, *Xestocis levettei* Casey, 1898:85. NEW SYNONYMY.
- Anobium*, *Plinius*, *Cis* auctt.

Form oblong, strongly convex; vestiture of short, fine hairs, longer recumbent hairs, or short, stout setae. Head moderately declined, partly covered by pronotum; frontoclypeal ridge of male produced on each side forming 2 flattened plates which are rounded to triangular; genal ridge strongly elevated and carinate, forming relatively deep antennal fossa. Antennae 10-segmented, with a 3-segmented club. Pronotum strongly convex, variously margined laterally, anterior angles rounded to produced and acute; anterior edge in male simple or produced and emarginate. Elytra with dual punctation, consisting of larger nude macropunctures, and smaller setiferous micropunctures, the punctures uniform or seriate. Prosternum relatively short, strongly tumid, concave laterally and carinate mesially; intercoxal process relatively narrow but not laminate, subacute at

apex. Protibia expanded at apex, outer apical angle produced and dentate. Sternite III of male with median pubescent fovea or patch.

A large genus with a primarily Holarctic distribution, but extending south at least in the Pacific region. Closely related to *Cis* and *Strigocis*, but distinguished by the strongly carinate prosternum, dual elytral punctation, and produced and dentate protibial apices. The genus differs from *Hadraule*, *Orthocis*, and *Dolichocis* in general body form and by the dentate protibial apices, as well as by the carinate prosternum. Most of the species in this genus feed on the larger woody fungi, such as *Fomes* and *Ganoderma*.

3. *ORTHO CIS*, *MELLIEICIS*, AND *DOLICHOCIS*

Casey (1898) proposed the genus *Orthocis* for the two American species, *Cis punctatus* Mellie and *Orthocis aterrima* Casey, which were distinguished from the species of *Cis* by the “. . . more parallel form of the body . . . glabrous surface, margined elytral suture, and . . . simple apex of the anterior tibiae.” Dury (1917) described a third species, *O. longula*, from the eastern U.S. and Kraus (1908) added two species, *O. hucsanus* and *O. pulcher*, from Florida. Another species, *O. platensis* Brèthes (1922), was described from Argentina.

In the European literature, it has long been recognized that *Cis alni* Gyllenhal, and several related forms, such as *C. perrisi* Abeille de Perrin and *C. coluber* Abeille de Perrin, form a distinct group, characterized by the elongate body form, short pubescence, simple protibial apices, and lack of distinct sexual modifications on the head or prothorax of the male. Lohse (1964) proposed for these species the subgenus *Mellicicis* and selected *Cis alni* as its type. Although the exact limits of the subgenus were not given in Lohse's paper, it was indicated that all species of *Cis* with rounded or truncate protibial apices should be included. Having studied the European literature and examined specimens in the American collections, I have come to the conclusion that both *Cis punctatus* Mellie *sensu* Casey and *Orthocis aterrima* Casey are very closely related to the Palearctic species in the *Cis alni* group. The name *Orthocis*, then, should apply to this group of species, and *Mellicicis* should be considered a junior synonym.

In 1908, Kraus described 3 species of *Ennearthron*, *E. annulatum*, *E. transversatum*, and *E. pallidum*, from the southeastern

United States and Cuba, which differ from the species of *Orthocis* only in the possession of 9-segmented antennae. I think it is only sensible to expand the definition of *Orthocis* to include these species as well, instead of leaving them in a genus which appears to be a conglomerate of unrelated forms. If the limits of the group are thus expanded, it becomes necessary to consider several other species which might be included. In 1919, Dury described the genus *Dolichocis* with the single species *D. manitoba* Dury, the main characteristics being the 9-segmented antennae, narrow, cylindrical form, vestiture of short bristles, and rounded protibial apices. The species differs from the American species of *Orthocis*, not only in its antennal segmentation, but by its stouter pubescence, anteriorly constricted prothorax, and the presence of 2 clypeal tubercles and a pubescent fovea on the head of the male. Hatch (1962) described a second species, *D. indistinctus*, from western North America, which is very similar to and obviously congeneric with *Enncarthron laricinum* (Mellie) of the European fauna. Other Palearctic species which might be in the same group are *Enncarthron yuasai* Chujo, *E. pruinosulum* (Perris), and *E. poriae* Nakane and Nobuchi, the last two of which resemble *Orthocis* more than *Dolichocis* in the more quadrate prothorax with broader lateral margins and in the absence of sexual modifications on the head of the male. The problem is made more complex by the presence of 3 Palearctic species, *Cis festivus* (Panzer), *Cis pygmaeus* (Marsham), and *Cis rhododactylus* (Marsham), and one North American species, *Cis angustus* Hatch, which share certain characteristics with both *Cis* and *Orthocis*. Nyholm (1953) noted that the first three all have truncate or rounded protibial apices, and I have observed the same character in *C. angustus*. Yet all of these have sexual ornaments on the head of the male, and they differ in general appearance from typical *Orthocis*. The setting of generic limits, if this is at all justified, presents a difficult problem, which can be solved only after a more detailed investigation of all species involved. In the present discussion, I will make a few suggestions based on a rather superficial study of a large number of forms from various parts of the world and a more intensive study of American representatives.

In the North American fauna, both *Orthocis* and *Dolichocis* seem to be well defined both morphologically and biologically. All of the species of *Orthocis* are elongate and parallel, with a

vestiture of very short and fine hairs, a fairly smooth and shining surface, margined elytral suture, flat or slightly tumid prosternum, rounded protibial apices, and an absence of sexual ornaments on the head of the male. There is a tendency in some species (*O. longulus* Dury) towards an extreme attenuation of the body, and several subtropical forms are bicolored and may have 9-segmented antennae. Field observations indicate that at least some species occur under bark, in decaying branches and vines, and apparently not in the tougher fruiting bodies of most Polyporaceae. The genus is more common in the southern part of the continent, and a number of unnamed species have been seen from Central and South America. The two species of *Dolichocis*, on the other hand, differ in having the prothorax constricted anteriorly, the vestiture consisting of short, stouter bristles, and the head modified in the male. Both species occur in the northern part of the continent, and, like most *Eridaulus*, they occur mainly on the fruiting bodies of woody fungi.

In the European fauna, generic distinctions are not so easily made. *Cis coluber* Abeille de Perrin, *C. reflexicollis* Abeille de Perrin, and *C. juglandis* Reitter appear to be closely related to *O. alni*, but they all have a stouter pubescence. Members of the *Cis festivus* group differ both in vestiture and in the presence of clypeal tubercles in the male. Of the species with 9-segmented antennae, *E. laricinum* undoubtedly belongs to *Dolichocis*, but *E. pruinosulum* appears to be closer to *Orthocis*. One character which has been overlooked by most European workers is the margined elytral suture in species of *Orthocis*. At the apex of each elytron, there is a distinct raised margin which curves laterad, leaving a narrow flat area between it and the edge of the suture. I have observed this in *O. alni*, as well as in the American species. This character, in combination with others mentioned above, might serve to distinguish consistently the species of *Orthocis* from those of *Cis* and *Dolichocis*. Several other features which I have observed only in the North American *Orthocis* are the elongate prementum, elongate maxillary stipes with a flattened laterally placed lacinia, and the deeply emarginate, mesially unpigmented, 8th sternite of the male. An investigation of these and other more cryptic characters in the European species may shed some light on their true relationships.

Orthocis, like *Eridaulus*, is so similar to *Cis* that the question arises whether a generic distinction is justified or not. I think

that the same criteria can be used here as were applied in the case of *Eridaulus*. The size of the group is quite large, especially in view of the number of unnamed species which I have seen, and the distribution is probably cosmopolitan, with the majority of species occurring in tropical and subtropical regions. Several unique trends occur within the genus, and it appears that the group may have given rise to some of the peculiar endemic forms on the Hawaiian Islands and in other Pacific areas. The latter resemble *Orthocis* in the minute vestiture, flattened prosternum, simple protibial apices, and lack of male ornaments, but they vary considerably in body form, sculpture, and coloration. The trend towards extreme attenuation has already been mentioned.

The biological characteristics of the genus, although briefly mentioned above, deserve further comment. Most of the species of Ciidae feed on the sporophores of wood-rotting fungi, especially the more fibrous or woody fruiting bodies of the Polyporaceae and Hydnaceae. These species have evolved various morphological and physiological adaptations to enable them to cope with a substrate which not only presents a physical barrier to feeding but usually contains little moisture and a high percentage of pure chitin, unavailable to insects not possessing a symbiotic intestinal flora. In addition, there has been a tendency for various species to specialize in certain groups of host fungi (Paviour-Smith, 1960). The species of *Orthocis*, whose habits have been recorded, appear to be general fungus feeders, occurring under bark, in dead branches and vines, in more humid situations, and in association with mycelia and fruiting bodies of a wide variety of wood-rotting fungi. The fungus sporophores are usually of a softer and more ephemeral type and their locations permit a certain amount of bacterial and fungal decomposition, so that the resulting substrate is more easily utilized by the beetles. Benick (1952) has reported *Cis alni* from such diverse fungi as *Eridia glandulosa* (Tremellaceae), *Stereum rugosum* (Thelephoraceae), and *Auricularia auricula-judae* (Auriculariaceae), while Lucas (1849) found the same species (as *C. punctulatus* Lucas, non Gyllenhal) on *Schizophyllum commune* (Agaricaceae). Blatchley (1910, 1923) noted that *O. punctatus* was taken by sifting debris from an oak log and that *O. pulcher* was found by beating dead branches of oak. Kraus (1908) bred *Ennearthron transversatum* from decaying rattan vines. Perris (1877) described the larva of *Cis coluber* from dead branches of chestnut and oak in which the fungus

Thelephora was growing; he also noted that the beetle could not be found on branches still remaining on the tree. In the same paper, he noted that the habits of *C. alni* and *C. reflexicollis* Abeille de Perrin were similar, and that *C. oblongus* Mellie and *C. pruinosulus* were taken on fungus-infested elm branches. Zimmerman (1938, 1942) and Swezey (1954) have recorded a number of Pacific island species from dead vines and branches, and those which I have examined seem to fall within this same group.

One fact that makes the study of the particular group more difficult is that most of the shared characters are both simple and apparently primitive. Most of the special modifications which are characteristic of the family as a whole, such as the development of protibial structures for boring (expanded apices, teeth, combs, spines), various prosternal modifications (shortening, carination, reduction of intercoxal process and increased coxal size), presence of sexual ornaments on the head and pronotum of the male, and the development of more complex punctuation and vestiture, are all absent in the species of *Orthocis*. In addition, the generalized fungus-feeding habit may be considered primitive. Members of closely related families, such as the Lathridiidae and Corylophidae, share this habit with the species of *Orthocis*, and Crowson (1955) thinks that this may have been characteristic of the ancestral Cucujoidea. If these characters are primitive or plesiomorphic, they are, according to Hennig (1965), less reliable than derivative or apomorphic ones in determining relationships. If, on the other hand, *Orthocis* represents a collection of two or more convergent groups, which have secondarily developed this type of feeding habit and thus have lost, through disuse, the structural modifications associated with boring, this convergence would probably be difficult to detect because of the simplicity of the resulting characters. I favor the hypothesis that these characters are primitive, rather than derivative, and that the feeding habits probably represent those of the common ancestor of the group. In certain other species, such as *Hadraule elongatula* and *Maphoca blaisdelli*, which have similar biologies, this simplified condition also occurs, but other characters indicate that both of these are derivative forms, which may have evolved from a species in the *Cis comptus* group.

I think that most of the species discussed above should be placed in a distinct genus, to which the name *Orthocis* applies. The exact limits of the genus remain uncertain, especially with reference to the inclusion of *Cis festivus* and its relatives, and

it is hoped that Dr. Lohse will shed some light on the relationships of these European species. I would definitely exclude *Cis angustus* Hatch, which does have a truncate protibial apex, but which occurs on *Fomes pinicola*, has elytral tubercles in the male, and lacks a margin on the elytral suture.

The species of *Dolichocis*, although they share certain characters with *Orthocis*, should remain in a separate genus, differing by the absence of the margin on the elytral suture, the anteriorly constricted prothorax, cylindrical form, and vestiture of short, stout setae. The genus should include the species *laricinus* (Mellie), *yuasai* (Chujo), *manitoba* Dury and *indistinctus* Hatch. All four species occur on the larger, woody fruiting bodies of fungi, such as *Fomes pinicola* and *F. officinalis*. Synonymies and redefinitions of *Orthocis* and *Dolichocis* are given below.

ORTHO CIS Casey

Orthocis Casey, 1898, Jour. New York Ent. Soc., 6(2):84; Kraus, 1908:77; Dalla Torre, 1911:20; Dury, 1917:13; Leng, 1920:247; Brèthes, 1922:302. Type, by present designation, *Orthocis aterrima* Casey, 1898:84.

Cis (*Mellieicis*) Lohse, 1964, Ent. Blätter, 60(2):122. Type, by original designation, *Cis alni* Gyllenhal, 1813:386. NEW SYNONYMY.

Ennecarthron, Kraus, 1908:78.

Cis (in part), auctt.

Form elongate and somewhat depressed to narrowly elongate and cylindrical; vestiture of very short fine hairs or stouter bristles. Head slightly to moderately declined, only slightly covered by pronotum; frontoelytral ridge without distinct sexual modifications in male; antennal fossa shallow. Antenna 9- or 10-segmented, with 3-segmented club, segments III and IV usually elongate; maxillary stipes elongate, lacinia lateral, palp relatively stout; prementum elongate. Pronotum subquadrate, sides narrowly margined to broadly margined and explanate, anterior angles truncate to slightly produced and rounded; anterior edge simple in both sexes. Elytra usually parallel sided; punctation single and relatively uniformly distributed; suture margined posteriorly, the margin curved laterad just before apex. Prosternum flat to slightly tumid, longer than intercoxal process which is fairly broad; procoxae subtransverse, narrowly open behind. Protibia only slightly expanded at apex, outer apical angle truncate or rounded. Metasternum slightly convex, the suture moderately long. Sternite III of male with a median pubescent fovea or patch.

A large, widespread genus, but mainly tropicopolitan. Closely related to *Cis* and *Dolichocis*, from which it differs by the rounded protibial apices, margined elytral suture, and lack of distinct sexual ornaments in the male. The species appear to be general fungus feeders, occurring often on dead vines and branches penetrated by fungus mycelia.

DOLICHOCIS Dury

Dolichocis Dury, 1919, *Canad. Ent.*, 51:158; Hatch, 1962:234. Type, by monotypy, *Dolichocis manitoba* Dury, 1919:158.

Cis (in part), Mellie, 1848:236; Lacordaire, 1857:551; Jacquelin Du Val, 1861:237; Seidlitz, 1872:44; Kiesenwetter, 1877:178.

Ennearthron (in part), Abeille de Perrin, 1874:80; Reitter, 1878:30; Seidlitz, 1891:285; Sebilsky, 1900:37B; Reitter, 1902:59; Dalla Torre, 1911:23; Chujo, 1941:85.

Form elongate, cylindrical; vestiture of short, stout, suberect bristles or squamae. Head moderately declined, partly covered by pronotum; frontoclypeal ridge of male bituberculate, vertex simple or foveate; anteunal fossa shallow. Antenna 9-segmented, with 3-segmented club; maxillary stipes subquadrate, lacinia subterminal, palp relatively stout. Pronotum almost as long as wide, somewhat constricted anteriorly, sides narrowly margined, anterior angles not or barely produced; anterior edge simple in both sexes. Elytra elongate and subparallel; punctation single and fairly uniformly distributed. Prosternum slightly tumid, slightly longer than intercoxal process which is fairly broad and blunt at apex; procoxae subtransverse, narrowly open behind. Protibia only slightly expanded at apex, outer apical angle truncate or rounded. Metasternum slightly convex, suture moderately long. Sternite III of male with a median pubescent fovea.

A small genus restricted to the Holarctic region. Closely related to *Cis* and *Orthocis*, from which it differs in the rounded protibial apices, stout vestiture, constricted prothorax, and lack of a margin along the elytral suture. The 4 species all occur on *Fomes pinicola* and related fungi.

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